REMARKS

Claims 1-29, all the claims pending in the application, stand rejected. Claims 4, 5, 7, 8, 19, 20 and 22-24 have been amended in order to place the application in condition for allowance.

Specification

The Examiner objects to the specification because certain text appears to be missing at page 17, line 12 and page 22, line 5. Applicant has amended the specification in both locations, by adding text that would be clear to one skilled in the art from the original disclosure.

In particular, the addition of the phrase "aforementioned slopes" simply completes the thought conveyed by the description of slopes in the earlier portions of the same paragraph.

Also, the addition of a particularly preferred range is clearly consistent with Applicants style used throughout the specification of presenting parameters with an upper boundary, an intermediary range and a preferred range at page 24, lines 15-21 and page 25, lines 10-12. The text at page 22 identifies an upper range of 500 μm, an intermediate range of 10 μm to 480 μm and a preferred range that was omitted. However, the omitted text of 50 μm to 450 μm would be apparent and deriveable by one skilled in the art. Moreover, the precise range is disclosed in the priority documents that were incorporated by reference into the present application at page 1, lines 13-15. A verified English language translation of Japanese Patent Application No. 2000-167162 is enclosed and clearly discloses the range at paragraphs [0019] and [0026].

On the basis of the foregoing, the amendment made by the applicant should be entered.

Claim Rejections - 35 U.S.C. § 112

Claims 6 and 21 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner argues that claims 6 and 21 are confusing because they recite that flat surfaces have projected areas on the polarizer plane, and that the description of these projected areas is unclear. In particular, the Examiner cites the phrase "not smaller than 10 times as large as a projected area" and asserts that such projected area cannot be 10 times larger than itself. However, Applicants respectfully submit that the claims are intended to state that a flat surface which is inclined at an angle of not larger than 5° with respect to the polarizer has a first projected area on the polarizer plane. This projected area is "not smaller than" ten times as large as a second projected area, where the second projected area is formed by the flat surface having an inclination angle not smaller than 35° with respect to the polarizer plane. In other words, the

claims state a relationship between first and second projected areas where the slope of the inclination is different.

Applicants respectfully submit that this language is clear, particularly based upon the examples given in the specification, for example beginning at page 57. Nonetheless, Applicants have amended the claims in order to provide added clarity, but not for purposes of patentability.

Claim Objections

Claims 4, 5, 7, 8 and 13-29 are objected to because of certain informalities. With regard to claims 4, 5, 7, 8, 19, 20, 22 and 23, the Examiner objects to the phrase "like an" and "such as" because they are considered indefinite. Applicant has amended the claims to remove these bases for rejection.

In addition, with regard to claim 13, the Examiner asserts that the phrase at line 5 should be changed to read "on said one side surface". Applicants submit that the original language is appropriate. However, Applicants have clarified the claim by stating that the polarizer has two side surfaces.

Finally, with regard to the Examiner's objection to claim 24, line 2, Applicants have remedied the basis for this objection by referring to the proper claim (23).

Double Patenting

The Examiner has rejected claim 1 provisionally under the judicially created doctrine of obviousness-type double patenting. The rejection is based upon a combination of four applications, commonly owned by the assignee of the present application, in view of the patent to Yamamoto et al (5,341,231) and Taira et al (5,712,694). These rejections are traversed because the claims in each of the four cited co-pending applications are clearly directed to a subject matter different from that which is set forth in claim 1.

Specifically, claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 2 and 5 of co-pending application S.N. 09/738,979 (Publication No. 2001/0004275) in view of Yamamoto et al and Taira et al. Claims 2 and 5 in the published application concern "a liquid crystal display device" including a LCD display. By contrast, claim 1 of the present application is directed to "an optical path changing polarizer" and not such display. Accordingly, since the inventions are totally different, there can be no double patenting.

Claim 1 is also provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2 and 5 of co-pending application S.N. 09/888,530 (Publication 2002/0015314) in view of Yamamoto et al and Taira et al. Claims 1, 2 and 5 in the published application are directed to a "light pipe" having plate-like members and anti-reflection layers. These claims are not directed to an optical path changing polarizer, as set forth in rejected claim 1. Accordingly, claim 1 would not be obvious in view of the teachings of the claimed invention since they are directed to totally different subject matter.

Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 2, 6 and 7 of co-pending Application S.N. 09/748,212 (Publication 2001/0007489) in view of Yamamoto et al and Taira et al. Claims 1, 2, 6 and 7 are directed to "a reflection-transmission double type liquid-crystal display device" comprising a liquid crystal device panel. Such structure is not set forth in rejected claim 1, which is directed to an optical path changing polarizer. Because of the distinct differences in claimed subject matter, there can be no basis for double patenting.

Claim 1 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1, 4 and 15 of co-pending Application S.N. 09/878,286 (Publication 2002/0039155) in view of Yamamoto et al and Taira et al. Claims 1, 4 and 15 are directed to a "liquid crystal display device" having a liquid-crystal display panel. Since the subject matter of these claims is totally different from the claimed optical path changing polarizer of claim 1, there can be no basis for double patenting.

Further, as subsequently demonstrated, the teachings of Yamamoto et al in combination with Taira et al are wholly inadequate to render the claimed invention unpatentable. Finally, even if the two references were pertinent, the claimed inventions remain totally different.

Claim Rejections - 35 U.S.C. § 103

Claims 1-6 and 9-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto et al (5,341,231) in view of Taira et al (5,712,694). This rejection is traversed.

Claims 13-21 and 24-29 are also rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto et al in view of Taira et al. This rejection is traversed.

As a preliminary matter, Applicants assume that the Examiner has stated a separate rejection for the group of claims that include and depend from independent claim 1 and the group

of claims that include and depend from independent claim 13. Nonetheless, both sets of claims are directed to "an optical path changing polarizer" and, on the basis of the following analysis and argument, all of claims 1-6, 9-21 and 24-29 should be considered patentable over Yamamoto et al in view of Taira et al.

The Invention

The present invention is particularly applicable to a light-distributing structure for use with a liquid-crystal display device where light incident on one side of the device is changed to a viewing direction in a highly efficient manner. The claimed invention is focused on the optical path changing polarizer that provides such change in light direction. In particular, as illustrated in Figs. 1A-1I, the polarizer device 1 comprises a polarizer (P) formed of a polarizing layer 13 that is sandwiched between protective layers 12, 14. A strip sheet 16 is applied by an adhesive 15 to one surface of the polarizer P and a repetitive prismatic layer 11a is applied to the other surface of the polarizer by an adhesive 11b. The repetitive prismatic layer has formed on one surface (the surface that is not attached to the polarizer) optical path changing slopes that are aligned in a substantially constant directed to have a surface A1 inclined at an angle in a range of 35-48° with respect to the plane of the polarizer. Various embodiments for such structure are illustrated in Figs. 1A to 1I, and these embodiments include a variety of polygon shapes that indent into or extend from the surface of the prismatic layer.

These features are substantially claimed in independent claims 1 and 13, which expressly recite a polarizer, an adhesive layer and a repetitive prismatic structure, particularly one with specified angles of inclination (35-48 degrees). Claim 13 also includes a further limitation that each of the respective refractive indexes of the adhesive layer and the material for forming the optical path changing slopes is not lower than a refractive index of the polarizing element or the transparent protective layer.

Yamamoto et al

The primary reference relied upon by the Examiner is Yamamoto et al, which is directed to a liquid crystal display device, as illustrated in Fig. 6. The display device receives edge lighting from a source 63a, 63b. From the point of the observer 70, the display device 60 includes a polarizer 64a, a light guide plate 61, a display element 72 (comprising transparent substrate 65a, liquid crystal layer 66 and transparent substrate 65b), adhesive 67b, second

polarizer 64b, adhesive layer 67c and aluminum reflective layer 68 having an irregular reflective surface 68a. As illustrated in Fig. 6, light from the source (e.g., 63b) is reflected at the surface 68a and is directed towards the viewer 70.

The Examiner admits at pages 8, 9, 12 and 13 of the Office Action that Yamamoto et al does not teach (1) a repetitive prismatic structure as claimed, (2) optical path changing slopes, as claimed, (3) flat surfaces which are inclined at an inclination angle not larger than 5° and not smaller than 35° and having specified projected areas, and (4) an optical path changing slopes with ridge lines parallel to or incline within an angle range of □30° with respect to one side of the polarizer. Accordingly, the Examiner must look to Taira et al for such supplemental teachings.

Taira et al

The Taira reference is concerned with an LCD having light provided by a fluorescent-tube emitter 101 provided to a side of a light guiding plate 103 for transmission along the length of the plate as non-polarized light (N) 104 and emission from the plate onto the PBS sheet 105 having a multi-layered film 106. As explained at col. 6, line 63-col. 7, line 12, a first polarized light is generated at the PBS sheet 105. Specifically, linearly polarized light (P) 107, defined by a polarized light component contained in an incident face, is transmitted through the multi-film layer 106 by interference effect, and is collected by the light-gathering function of a prism sheet 109. A second polarized light component (S) 108 is emitted to the multi-layered sheet 106 and is reflected back., and ultimately is transmitted out. The prism sheet 109 has prism faces of groove-like form. Prism sheet 110 is formed in a manner so that the polarized light 107 incident onto the sheet 105 is a P wave with respect to the prism face 110.

With this basic embodiment in mind, the Examiner specifically refers to Figures 14 and 15 for a teaching of a light guiding plate 103 which receives light from a fluorescent source 101 and, using depressed portions 1201, as described at col. 3, line 50-col. 4, line 64, permits the non-polarized light (N 1202) from fluorescent source 101 to be reflected. With reference to Fig. 15, the non-polarized light 1301 is reflected as polarized light 1302 from the boundary face 1306, the reflected light containing approximately 15% S wave. The boundary face 1306 also transmits the remainder of the light, according to the patent, transmitting approximately 85% S polarization and 100% P polarization. In this manner, only the S wave is emitted from the light-

guiding plate and used as a polarized illumination light. As explained at col. 14, line 22, the P wave is appropriately converted in an S wave by repeating reflection diagonally to the polarizing direction. Because of this continued conversion of P wave to an S wave at successive depressed portions 1201, there appears to be no need for a polarizer in this embodiment. Indeed, none of the optical path structures in the patent have a layer designated as a "polarizer.". Indeed, the only reference to a polarizer in Taira et al is with respect to the plates in the light emitting structures 2602 and 2603 in Fig. 31 and layer 3109 in Fig. 36.

For such a structure, having no polarizer, the patent teaches at col. 14, lines 44-64 that the light guiding plate made of different materials (PMMA and PC) may use different incident angles α of light 1301, within a range of 0-48.2° to achieve total reflection. The boundary face may be disposed in an angle θ, formed with regard to the flat lower surface of the light guiding plate within a range of 3-56.3°, preferably 26.3-36.3° for PMMA. With regard to PC, the range of α is 0-51.3° and the range of θ is 16-58°, preferably 28-38°.

The Rejection

The Examiner has engaged in impermissible hindsight in combining these two references. First, the deficiencies in Yamamoto et al are clear and acknowledged by the Examiner. While Yamamoto et al utilizes a polarizer 64b, it relies upon a solid metal (aluminum) reflector 68 that is affixed to the polarizer 64b by an adhesive 67c to reflect light. There is no consideration in this patent that the reflector 68 may be a light transmissive structure instead. Indeed, Yamamoto et al does not rely on light migrating down the length of a light guiding plate, as in Taira et al. Further, there is no consideration of the possibility that a repetitive prismatic structure may be provided on one side of the polarizer. Taira et al, on the other hand, teaches a structure that does not use a polarizer. Instead, Taira et al appears to rely upon the polarization effect of the boundary face 1306 of the indented surface to provide light with S-type and P-type polarization. Accordingly, there would be no incentive to substitute the sculpted light guiding plate of Taira for the solid metal reflector in Yamamoto et al and to use a polarizer and light guiding plate in combination. In the absence of such motivation, the references may not be combined and the rejection should be overcome. Moreover, they may be seen as teaching in opposite directions, that is, structures with a polarizer and structures without a polarizer.

The dependent claims 2-12 and 14-29 would be patentable on the basis of their dependency from independent claims 1 and 13.

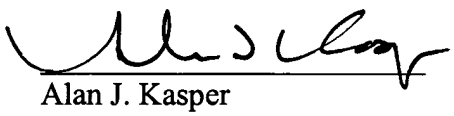
Claims 5 and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Yamamoto et al in view of Taira et al and further in view of Hira et al (5,961,198). This rejection is traversed.

With regard to claims 5 and 20, the Examiner notes that neither Yamamoto nor Taira et al teach optical path changing slopes formed into a structure of grooves or protrusions each substantially shaped like a tetragon or pentagon in section. The Examiner refers to Hira for such teaching, particularly in Figures 20(a), 20(c) and 21(a)-21(c). The Examiner considers it obvious to combine the references to result in the invention as claimed. However, Hira et al does not remedy the deficiencies of Yamamoto et al and Taira et al. While the reference is directed to a light guide panel and liquid crystal display device, it does not teach the combination of a polarizer and a repetitive prismatic structure provided on one side of the polarizer. As with Taira, no polarizer is taught. Accordingly, the rejected claims should be held patentable.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The specification is changed as follows:

Page 17, first full paragraph:

When two adjacent cross side surfaces of the optical path changing polarizer are used as incidence side surfaces on which the light is incident, there is preferably used an optical path changing polarizer having two kinds of optical path changing slopes A1 corresponding to the incidence side surfaces so that the ridgelines of the two kinds of optical path changing slopes A1 are parallel to the two cross side surfaces respectively. When three or more side surfaces inclusive of opposite side surfaces and adjacent cross side surfaces are used as incidence side surfaces on which the light is incident, there is preferably used an optical path changing polarizer having optical path changing slopes A1 constituted by a combination of the aforementioned slopes.

Page 22, paragraph bridging pages 21 and 22:

As illustrated in Figs. 2 to 4, the plurality of optical path changing means A are provided so that the ridgelines of the optical path changing means A are parallel to or inclined to the incidence side surface on which light is incident. In this case, the optical path changing means A may be formed so as to be continued from one end to the other end of the optical path changing polarizer 1 as illustrated in Figs. 2 and 3, or may be formed intermittently and discontinuously as illustrated in Fig. 4. When the plurality of optical path changing means A are formed discontinuously, it is preferable from the point of view of efficiency of incidence of the transmission light, efficiency of changing the optical path, etc. that the length of each prismatic structure made of a groove or a protrusion along the direction of the incidence side surface is selected to be not smaller than 5 times as large as the depth or height of the prismatic structure. It is further preferable from the point of view of uniform light emission on the polarizer that the length is selected to be not larger than 500 μm, particularly in a range of from 10 to 480 μm, more particularly in a range of from 50 to 450 μm.

IN THE CLAIMS:

The claims are amended as follows:

4. (Amended) An optical path changing polarizer according to claim 1, wherein said optical path changing slopes are formed into a structure of grooves each substantially triangular shaped [like an isosceles triangle or any other triangle in section].

5. (Amended) An optical path changing polarizer according to claim 1, wherein said optical path changing slopes are formed into a structure of grooves or protrusions each having one of a substantially [shaped like a] tetragon shape or a pentagon shape in section.

6. (Amended) An optical path changing polarizer according to claim 1, wherein flat surfaces each of which is inclined at an inclination angle of not larger than 5 degrees with respect to said [polarization plate] polarizer plane has a first projected area, on said polarizer plane, not smaller than 10 times as large as a second projected area, on said polarizer plane, of slopes each of which is inclined at an inclination angle of not smaller than 35 degrees with respect to said polarizer plane.

7. (Amended) An optical path changing polarizer according to claim 1, wherein said prismatic structure is constituted by a combination of said optical path changing slopes and flat surfaces, wherein each of said optical path changing slopes is inclined at an inclination angle in a range of from 38 to 45 degrees with respect to said polarizer plane, wherein each of said flat surfaces is inclined at an inclination angle of not larger than 5 degrees with respect to said polarizer plane and has a width of not smaller than 10 times as large as the width of each of said optical path changing slopes, and wherein said structure is formed by grooves each of which [is] has substantially [shaped like] a triangle shape in section and which are continued from one end to the other end of said polarizer.

8. (Amended) An optical path changing polarizer according to claim 1, wherein said prismatic structure is constituted by discontinuous grooves each having substantially [shaped like] a polygon shape [such as a triangle, a tetragon or a pentagon] in section, wherein the length of each of said discontinuous grooves is not smaller than 5 times as large as the depth of each of said discontinuous grooves, wherein said optical path changing slopes are formed in a

direction of the length of said grooves and inclined at an inclination angle in a range of from 38 to 45 degrees with respect to said polarizer plane, and wherein a projected area, on said polarizer plane, of said discontinuous grooves is not larger than 10 % of said polarizer plane.

13. (Amended) An optical path changing polarizer comprising:

a polarizer including a polarizing element and a transparent protective layer disposed on at least one side of said polarizing element, said polarizer having two side surfaces;

an adhesive layer disposed on one side surface of said polarizer; and

a repetitive prismatic structure disposed on the other side of said polarizer, said repetitive prismatic structure including optical path changing slopes aligned in a substantially constant direction so as to be inclined at an inclination angle of from 35 to 48 degrees with respect to a plane of said polarizer;

wherein each of respective refractive indexes of said adhesive layer and a material for forming said optical path changing slopes is not lower than a refractive index of said polarizing element or said transparent protective layer.

16. (Amended) An optical path changing polarizer according to claim 13, wherein at least said adhesive layer disposed on said one side surface of said polarizer is a tacky layer.

20. (Amended) An optical path changing polarizer according to claim 13, wherein each of said optical path changing slopes is based on a groove or protrusion structure having one of a substantially [shaped like a] tetragon or a pentagon shape in section.

21. (Amended) An optical path changing polarizer according to claim 13, wherein a first projected area, on said polarizer plane, of any flat surface having an inclination angle of not larger than 5 degrees with respect to said polarizer plane is not smaller than 10 times as large as a second projected area, on said polarizer plane, of any slope having an inclination angle of not smaller than 35 degrees.

22. (Amended) An optical path changing polarizer according to claim 13, wherein said structure of irregularities has optical path changing slopes each inclined at an inclination angle in a range of from 38 to 45 degrees with respect to said polarizer plane, and flat surfaces each inclined at an inclination angle of not larger than 5 degrees with respect to said polarizer

plane and each having a width not smaller than 10 times as large as a width of each of said optical path changing slopes, and wherein said structure is formed by continuous grooves each of which [is] has substantially [shaped like a triangle] a triangular shape in section and each of which is extended from one end to the other end of said polarizer.

23. (Amended) An optical path changing polarizer according to claim 13, wherein: said structure of irregularities having optical path changing slopes is formed by discontinuous grooves each has substantially [shaped like] a polygon shape [such as a triangle, a tetragon or a pentagon] in section; a length of each of said discontinuous grooves is not smaller than 5 times as large as a depth of said groove; said optical path changing slopes are formed in a direction of the length of said grooves and inclined at an inclination angle in a range of from 38 to 45 degrees with respect to said polarizer plane; and a ratio of an area of said discontinuous grooves to an area of said one side surface of said polarizer is not higher than 10 %.

24. (Amended) An optical path changing polarizer according to claim [13] 23, wherein said discontinuous grooves having optical path changing slopes are arranged at random.